Analytical View of Railway Accidents. By F. G. P. Neison, Esq.

(*Continued from page* 337, *vol.* xvi.)

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In the preceding portion of this paper, a very complete analysis was given of railway accidents as they affected passengers; and it is now proposed to investigate the manner in which railway employés themselves suffer from accidents while following their avocations.

Some difficulty was experienced in this part of the inquiry owing to the obscurity which obtained as to the precise number of persons employed in different departments of the railway service during the earlier years to which the investigation relates. Since 1848, however, several parliamentary returns afford the means of making a near approximation to the number of persons employed in the different departments, and hence offer a ready means by which to determine the numbers constantly exposed to the risk of accidents.

From the data in the following Table, XXXI., these numbers are easily deduced.

The returns which furnish the data for the two last columns of this table were issued subsequent to the preparation of the principal part of this paper; but it will be found that the principle on which the table has been constructed produces results almost identical for practical purposes with those given in the parliamentary returns themselves.

Table XXXII. exhibits the number of employés of different descriptions exposed continuously to the risk of accidents. The principle on which it has been constructed from the data contained in Table XXXI., is obvious.

By the aid of Tables XXXI. and XXXII., Table XXXIII. has been calculated, so as to show for precisely the same periods of time to which the data given in the preceding paper relate, the number of employés exposed to risk, thus preparing the different elements entering into this inquiry in a fitting shape, from which to determine the relation of the one to the other. The mode by which these figures have been obtained from Tables XXXI. and XXXII., will be at once understood on a careful perusal.

This table will be found exceedingly useful for future reference by those giving attention to the economics of our railway system generally, as well as to those who may direct their attention to the special object of this inquiry. The next Table, XXXIV., will complete the principal series of elementary facts which enter into the present part of this investigation. The details as to deaths and injuries will be found in Table XII., page 305, of vol. xvi.; and those in regard to the numbers exposed to the risks of accidents will be found as already stated in the three preceding Tables, XXXI., XXXII, and XXXIII.

It will frequently be necessary to refer to the facts set forth in Table XXXIV.; but, for the immediate purpose of determining the ratio of deaths and injuries from all causes or kinds of railway accidents amongst employés, compared with the ratio found in the preceding paper to prevail amongst passengers, Table XXXV. will be convenient.

TABLE XXXI.

Number and Description of Persons Employed on all Railways open for Traffic in Great Britain and Ireland.

Class of Persons.	On 1st May, 1848.	On 30th June, 1848.	On 30th June, 1849.	On 30th June, 1850.	On 30th June, 1851.	On 31st Dec., 1851.	Total from 30th June, 1848, to 31st Dec., 1851.	On 30th June, 1852.	On 30th June, 1853.
Superior officers (*g*)	6,298	6,468*	7,490	8,298†	9,106	9,510‡	28,330§	8,702	9,949
Engine-men, or Drivers	1,752	1,764	1,839	2,049	2,258	2,363	7,080	2,397	2,821
Assistant Engine-men, or Stokers	1,809	1,818	1,871	2,129	2,387	2,516	7,360	2,460	2,869
Conductors, or Guards ...	1,496	1,515	1,631	1,941	2,252	2,407	6,660	2,257	2,641
Artificers (*a*)	10,814	10,813	10,809	11,636	12,463	12,876	40,521	13,878	15,624
Switchmen (*b*).....	1,058	1,127	1,540	1,703	1,865	1,946	5,711	1,605	2,223
Policemen (*c*)	2,475	2,337	1,508	1,553	1,599	1,622	5,841	1,567	1,542
Porters and Messengers	7,559	7,656	8,238	9,007	9,776	10,160	31,041	10,434	12,188
Plate-layers (*d*)	4,391	4,551	5,508	5,557	5,605	5,629	18,957	4,909	6,033
Labourers (*e*)	14,438	14,380	14,029	14,419	14,810	15,005	50,551	13,682	18,987
Miscellaneous (*f*)	598	728	1,505	1,474	1,442	1,426	4,777	2,626	2,069
$a+b+c+d+e+f+g$ and others	40,072	40,403	42,389	44,639	46,890	48,015	154,682	50,053	59,890

The figures of the 3rd, 5th, and 7th columns are thus derived, viz.:—

* As 14 months $\left(\begin{matrix}\text{1st May, 1848,}\\ \text{to}\\ \text{30th June, 1849,}\end{matrix}\right)$: 1,192 = $\left\{\begin{matrix}\text{7,490—6,298}\\ \text{or}\\ \text{increase in}\\ \text{that time}\end{matrix}\right\}$ :: 2 months $\left(\begin{matrix}\text{1st May, 1848,}\\ \text{to}\\ \text{30th June, 1848,}\end{matrix}\right)$: increase in that time = 170. Then 6,298 + 170 = 6,468.

† $8{,}298 = \frac{7{,}490 + 9{,}106}{2}$.

‡ As 24 months $\left(\begin{matrix}\text{30th June, 1849,}\\ \text{to}\\ \text{30th June, 1851,}\end{matrix}\right)$: 1,616 = (increase) :: 6 months $\left(\begin{matrix}\text{30th June, 1851,}\\ \text{to}\\ \text{31st Dec., 1851,}\end{matrix}\right)$: increase = 404. Then 9,106 + 404 = 9,510.

§ See Table XXXII. (Note †).

TABLE XXXII.

Number and Description of Railway Company's Servants exposed to Risk from 30th June, 1848, to 31st December, 1851.

YEARS.	(g) Superior Officers.	Engine Drivers.	Stokers.	Guards.	(a) Artificers.	(b) Switch-men.	(c) Police-men.	Porters.	(d) Plate-layers.	(e) Labourers.	(f) Miscel-laneous.	a+b+c+d+e+f+g "Other Servants."	Totals.
30th June, 1848, to 30th June, 1849	6,979†	1,801½	1,844½	1,573	10,811	1,333½	1,922½	7,947	5,029½	14,209½	1,116½	41,396	95,963½
30th June, 1849, to 30th June, 1850	7,894	1,943¾	2,000	1,786¼	11,222½	1,621¼	1,530¾	8,622½	5,532¼	14,224¼	1,489¾	43,514¼	101,381½
30th June, 1850, to 30th June, 1851	8,702	2,153¼	2,258	2,096¾	12,049½	1,783¾	1,576¼	9,391½	5,580¾	14,614¾	1,457¾	45,764¾	107,429
30th June, 1851, to 31st Dec., 1851	4,755	1,181½	1,258	1,203½	6,438	973	811	5,080	2,814½	7,502½	713	24,007½	56,737½
(Col. 8, Table A). Totals—3½ years	28,330†	7,080	7,360½	6,659½	40,521	5,711½	5,840½	31,041	18,957	50,551	4,777	154,682½	361,511½

The numbers in this table are thus obtained (see Table XXXI):—

† Average number from 30th June, 1848, to 30th June, 1849, $= \frac{6,468+7,490}{2} = 6,979$

" " 1849, " 1850, $= \frac{7,490+8,298}{2} = 7,894$

" " 1850, " 1851, $= \frac{8,298+9,106}{2} = 8,702$

" 30th June to 31st December, 1851, $= \frac{9,106+9,914*}{4} = 4,755$

Total 28,330†

* 9,914, number employed at end of year (from 30th June.)

For, increase in half-year = (9,510 − 9,106) = 404,

∴ " whole year = 808.

Table XXXIII.

Number and Description of Employés *exposed to Risk in the undermentioned Years.*

Date.	1. Superior Officers. (*g*)	2. Engine Men.	3. Stokers.	4. Guards.	5. Artificers. (*a*)	6. Switch-men. (*b*)	7. Police-men. (*c*)	8. Porters.	9. Plate-layers. (*d*)	10. Labourers. (*e*)	11. Miscel-laneous. (*f*)	12. *a*+*b*+*c*+*d*+*e*+*f*+*g*.
Last 5 mths. of 1840	824	208	216	193	1,201	164	184	911	558	1,515	135	4,581
Year 1841	2,243	566	587	525	3,270	446	501	2,480	1,518	4,122	368	12,468
,, 1842	2,449	618	641	573	3,570	487	547	2,708	1,657	4,501	402	13,613
,, 1843	2,588	659	683	611	3,805	519	583	2,886	1,766	4,797	429	14,487
Total ...	8,104	2,051	2,127	1,902	11,846	1,616	1,815	8,985	5,499	14,935	1,334	45,149
Year 1844	2,787	709	735	658	4,096	559	627	3,107	1,901	5,163	461	15,593
,, 1845	3,211	809	845	751	4,681	638	716	3,550	2,173	5,901	527	17,847
,, 1846	3,677	928	962	860	5,273	731	820	4,065	2,488	6,757	604	20,350
,, 1847	4,807	1,212	1,258	1,125	7,008	956	1,073	5,315	3,253	8,835	789	26,721
Total ...	14,482	3,658	3,800	3,394	21,058	2,884	3,236	16,037	9,815	26,656	2,381	80,511
Year 1848	6,468	1,764	1,818	1,515	10,813	1,127	2,337	7,656	4,551	14,380	728	40,404
,, 1849	7,490	1,839	1,871	1,631	10,809	1,540	1,508	8,238	5,508	14,029	1,505	42,389
,, 1850	8,298	2,049	2,129	1,941	11,636	1,703	1,553	9,007	5,557	14,419	1,474	44,640
,, 1851	9,106	2,258	2,387	2,252	12,463	1,865	1,599	9,776	5,605	14,810	1,442	46,890
Total	31,362	7,910	8,205	7,339	45,721	6,235	6,997	34,677	21,221	57,638	5,149	174,323
Total of 3 periods.	53,948	13,619	14,132	12,635	78,625	10,735	12,048	59,699	36,535	99,229	8,864	299,983
Year 1852	9,609	2,446	2,537	2,269	14,136	1,928	2,163	10,722	6,561	17,827	1,592	53,897
Grand Total....	63,557	16,065	16,669	14,904	92,761	12,663	14,211	70,421	43,096	117,056	10,456	353,880

TABLE XXXIV.

Showing the Per-Centage of Deaths and Injuries amongst each class of Railway Employés *during the last Five Months of* 1840, *and during each year down to* 1853.

Year.	Engine Drivers.					Stokers.					Guards.					Porters.					Other Servants.				
	Number Exposed.	Killed.	Injured.	Per-Centage of Deaths.	Per-Centage of Injuries.	Number Exposed.	Killed.	Injured.	Per-Centage of Deaths.	Per-Centage of Injuries.	Number Exposed.	Killed.	Injured.	Per-Centage of Deaths.	Per-Centage of Injuries.	Number Exposed.	Killed.	Injured.	Per-Centage of Deaths.	Per-Centage of Injuries.	Number Exposed.	Killed.	Injured.	Per-Centage of Deaths.	Per-Centage of Injuries.
1840...	208	1	6	·481	2·885	216	1	5	·463	2·315	193	...	2	...	1·036	911	1	...	·110	...	4,581	12	8	·262	·175
1841...	566	1	4	·177	·707	587	...	4	...	·682	525	1	5	·190	·952	2,480	4	3	·161	·121	12,468	23	18	·184	·144
1842...	618	2	4	·324	·647	641	4	5	·624	·780	573	7	2	1·222	·349	2,708	3	2	·111	·074	13,613	27	22	·198	·162
1843...	659	3	4	·455	·607	683	2	5	·293	·732	611	5	2	·818	·327	2,886	8	4	·277	·139	14,487	21	13	·145	·090
	2,051	7	18	·341	·878	2,127	7	19	·329	·893	1,902	13	11	·683	·578	8,985	16	9	·178	·100	45,149	83	61	·184	·135
1844...	709	7	6	·989	·846	735	6	12	·816	1·633	658	5	6	·760	·912	3,107	6	4	·193	·129	15,593	28	17	·180	·109
1845...	809	3	5	·371	·618	845	7	8	·828	·947	751	6	7	·799	·933	3,550	6	2	·169	·056	17,847	36	23	·202	·129
1846...	928	7	14	·754	1·509	962	7	11	·163	1·144	860	9	9	1·046	1·046	4,065	7	7	·172	·172	20,350	61	35	.300	·172
1847...	1,212	11	6	·916	·495	1,258	22	17	1·749	1·351	1,125	10	9	·889	·800	5,315	12	4	·226	·075	26,721	67	31	.251	·116
	3,658	28	31	·765	·847	3,800	42	48	1·105	1·263	3,394	30	31	·884	·913	16,037	31	17	·193	·106	80,511	192	106	·238	·131
1848...	1,764	6	11	·340	·624	1,818	14	14	·770	·770	1,515	22	10	1·452	·660	7,656	10	6	·131	·078	40,404	86	33	·213	·082
1849...	1,839	6	8	·326	·435	1,871	13	7	·695	·374	1,631	15	14	·920	·858	8,238	13	8	·158	·097	42,389	82	41	·193	·097
1850...	2,049	4	11	·195	·536	2,129	16	8	·752	·376	1,941	21	15	1·082	·773	9,007	9	5	100	·056	44,640	79	22	·177	·049
1851...	2,258	11	5	·487	·221	2,387	6	10	·251	·418	2,252	14	3	·622	·133	9,776	19	11	·194	·113	46,890	63	21	·134	·045
	7,910	27	35	·341	·442	8,205	49	39	·597	·475	7,339	72	42	·981	·572	34,677	51	30	·147	·086	174,323	310	117	·178	·067
1852...	2,446	11	10	·449	·409	2,537	18	17	·709	·670	2,269	12	16	·529	·705	10,722	19	9	·177	·084	53,897	63	37	·117	·069
1840 to 1851	13,619	62	84	·455	·617	14,132	98	106	·693	·705	12,635	115	84	·910	·665	59,699	98	56	·164	·094	299,983	585	284	·195	·095
1840 to 1852	16,065	73	94	·454	·585	16,669	116	123	·695	·738	14,904	127	100	·852	·671	70,421	117	65	·166	·092	353,880	648	321	·183	·091

TABLE XXXV.

Number and Ratio of Deaths and Injuries from all Causes among Employés.

Period.	Engine Drivers.			Ratios.	
	Number.	Killed.	Injured.	One Killed in	One Injured in
7th Aug. 1840 to 1843	2,051	7	18	293	114
,, 1844 ,, 1847	3,658	28	31	131	118
,, 1848 ,, 1851	7,910	27	35	293	226
,, 1840 to 1851	13,619	62	84	220	162
,, 1852	2,446	11	10	222	245
Grand Total	16,065	73	94	220	171

Period.	Stokers.			Ratios.	
	Number.	Killed.	Injured.	One Killed in	One Injured in
7th Aug. 1840 to 1843	2,127	7	19	304	112
,, 1844 ,, 1848	3,800	42	48	90	79
,, 1848 ,, 1851	8,205	49	39	168	210
,, 1840 to 1851	14,132	98	106	144	133
,, 1852	2,537	18	17	141	149
Grand Total	16,669	116	123	144	136

Period.	Guards.			Ratios.	
	Number.	Killed.	Injured.	One Killed in	One Injured in
7th Aug. 1840 to 1843	1,902	13	11	146	173
,, 1844 ,, 1847	3,394	30	31	113	109
,, 1848 ,, 1851	7,339	72	42	102	175
,, 1840 to 1851	12,635	115	84	110	150
,, 1852	2,269	12	16	189	142
Grand Total	14,904	127	100	117	149

Period.	Porters.			Ratios.	
	Number.	Killed.	Injured.	One Killed in	One Injured in
7th Aug. 1840 to 1843	8,985	16	9	562	998
,, 1844 ,, 1847	16,037	31	17	517	943
,, 1848 ,, 1851	34,677	51	30	680	1,156
1840 to 1851....	59,699	98	56	609	1,066
1852	10,722	19	9	564	1,191
Grand Total	70,421	117	65	602	1,083

TABLE XXXV.—*Continued.*

Period.	Other Servants.			Ratios.	
	Number.	Killed.	Injured.	One Killed in	One Injured in
7th Aug. 1840 to 1843	45,149	83	61	544	740
,, 1844 ,, 1847	80,511	192	106	419	760
,, 1848 ,, 1851	174,323	310	117	562	1,490
,, 1840 to 1851	299,983	585	284	513	1,056
,, 1852	53,897	63	37	856	1,457
Grand Total	353,880	648	321	546	1,102

From this Table, it will be seen that the ratio of deaths per annum amongst different classes of employés for the whole period of years, now under consideration, has been as follows, viz.:—

The ratio of deaths per annum among		Engine-Drivers	=	1 in 220
,,	,,	Stokers	=	,, 144
,,	,,	Guards	=	,, 117
,,	,,	Porters	=	,, 602
,,	,,	Other Servants	=	,, 546

It is thus evident that, for the whole period from 1840–52, the ratio of deaths has been, amongst the first three classes of servants, least in the group engine-drivers, and highest in that of guards. A similar result also appeared in Table XXXIV. This relation, however, of the mortality from accidents has not been uniformly maintained by the same three classes throughout the whole of the period under observation, as will be seen by a comparison of the mortality of stokers with that of guards for the period 1844–48. The mortality of the fourth and fifth groups of employés differs widely from that of the other three groups; and the same remark is applicable to the ratio of injuries in the same groups.

The ratio of injuries being among		Engine-Drivers	=	1 in 171
,,	,,	Stokers	=	,, 136
,,	,,	Guards	=	,, 149
,,	,,	Porters	=	,, 1,083
,,	,,	Other Servants	=	,, 1,102

In respect to deaths, the ratio for stokers was intermediate between that for engine-drivers and guards; but so far as injuries are concerned, the ratio for stokers is higher than that for either guards or engine-drivers,

It will assist the object of this inquiry to consider the facts of the preceding Table, as given in the following condensed summary:—

ABSTRACT N.

Period.	Engine Drivers, Stokers, and Guards.			Ratios.	
	Number.	Killed.	Injured.	One Killed in	One Injured in
1840 to 1843....	6,080	27	48	229	129
1844 ,, 1847....	10,852	100	110	109	99
1848 ,, 1851....	23,454	148	116	158	200
1840 to 1851....	40,386	275	274	147	148
1852	7,252	41	43	177	169
Grand Total	47,638	316	317	151	150

Period.	Porters and Other Servants.			Ratios.	
	Number.	Killed.	Injured.	One Killed in	One Injured in
1840 to 1843....	54,134	99	70	547	773
1844 ,, 1847....	96,548	223	123	433	785
1848 ,, 1851....	209,000	361	147	579	1,422
1840 to 1851....	359,682	683	340	527	1,058
1852	64,619	82	46	788	1,405
Grand Total	424,301	765	386	555	1,099

This abstract presents facts of a very remarkable nature when compared with those given in Abstract H, page 306, of the former paper. In the preceding abstract, it will be seen that, in the first group of employés, consisting of engine-drivers, stokers, and guards, the numbers of injuries and deaths are almost identical, while amongst passengers (see Abstract O) the ratio of injured to killed was 675·20 per cent.

In regard, however, to the group consisting of porters and other servants, the number killed has been 1 in 555, and the number injured has been 1 in 1,099; or the ratio of injured to killed about 50·04 per cent.

In this way of looking at the question, some results are disclosed, and which merit important consideration.

ABSTRACT O.

Class.	Numbers.		Ratio of Injured to Killed.
	Killed.	Injured.	
Engine-Drivers, Stokers, and Guards....	316	317	About equal
Porters and other Servants.....	765	386	50·46 per cent.
Passengers	266	1,796	675·20 ,,

There appears in this abstract a very curious law, but one

which, on reflection, is quite consistent with the circumstances known to influence the risk to which each class of persons is exposed. By viewing, in connection with the preceding results, some of the facts set forth in Abstract O, the following conclusions are arrived at:—

ABSTRACT P.

Class of Persons exposed to Risk.	Numbers.		Ratio of the Injured to Killed.
	Killed.	Injured.	
Trespassers	306	84	27·45 per cent.
Public by their own negligence	175	65	37·14 ,,
Other Servants	648	321	49·54 ,,
Porters and other Servants	765	386	50·46 ,,
Porters	117	65	55·56 ,,
Engine-Drivers, Stokers, and Guards	316	317	About equal
Passengers	266	1,796	675·20 ,,

A very slight consideration of the nature of the circumstances, under which the accidents take place in each of the above classes, will at once explain the great disparity between the ratio of the killed and injured. If the different circumstances in which the two classes of trespassers and passengers be contrasted, it will at once appear that, in the event of an accident occuring, the chances of its proving fatal differ widely in the two groups; the former being injured principally by trains overtaking them while in motion, and consequently the probability of the accident proving fatal is very great; but, in regard to the latter, it has been shown in Table IV., that the bulk of accidents to passengers take place under circumstances of a much less violent nature, and in which the tendency to be fatal is quite inconsiderable compared with the accidents to which trespassers are liable. Of the 297 defined causes of fatal accidents to trespassers recorded in Table VI., no less than 268 are assignable to the cause "run over;" while, of the 228 fatal accidents to passengers, 99, or 43·42 per cent., have been occasioned by collisions of trains, and trains running off the line. Accidents of this kind, it will be found, are of a less violent nature than any other, and have, therefore, less tendency to be fatal; and if these facts be kept distinctly in view, the great disparity in the relative fatality of accidents in different classes, as shown in Abstract P, will be readily understood. The following illustration of the tendency of different classes of accidents, so far as passengers are concerned, to prove fatal may be interesting and instructive on this point of the inquiry:—

ABSTRACT Q.

Ratio of Injured to Killed amongst Passengers from different causes.

Causes.	Killed.	Injured.	Ratio of Injured to Killed.
Collisions, running off line, and collision at station	99	1,505	1520·20 per cent.
All other defined causes	129	230	178·29 ,,

Accidents from the last group of causes, it will be seen, are of a much more fatal character than those in the first group; and an inspection of the causes, included in the last of the above groups, will show that they are of a kind more in common with those which affect railway servants in general, than the causes contained in the first group, and hence the explanation of the disparity exhibited in Abstract P preceding.

Abstract R gives a succinct view of the liability of different classes of persons to be injured by accidents from various causes, and also the chances of those accidents proving fatal; and it will be seen, that, in the following classes, the great bulk of the accidents take place under circumstances in which the cause of injury is of a very violent nature, and can, with few exceptions, be scarcely otherwise than fatal:—

Of all the deaths amongst	Trespassers	90·24 per cent.	Have occurred from being run over by trains.
	Public by their own negligence	88·66 ,,	
	Other Servants	61·50 ,,	
	Porters	30·39 ,,	

Again, it will be seen, that, in the following classes, the accidents also taking place under circumstances likely to be fatal:—

Of the deaths among	Engine-Drivers	46·03 per cent.	Are caused by "Running off the Line" and "Falling from Train."
,, ,,	Stokers	52·96 ,,	"Running off Line," "Falling from Train," and "Crushed."
,, ,,	Guards	82·21 ,,	"Falling from Train," "Mounting Train in Motion," "Run over," and "Crushed."
,, ,,	Porters	70·58 ,,	"Run over" and "Crushed."

These facts are sufficient to account for the tendency of different kinds of accidents, as they affect different classes of persons, to prove fatal. In Abstract Q, it will be found, that accidents to passengers from "collisions," "running off the line," and "collisions at stations," were much less fatal than those taking place from other causes; so also will it be found that, amongst the three important classes of railway servants, engine-drivers, stokers, and guards, is the tendency of accidents, from the same three causes, much less fatal than from other causes.

ABSTRACT R.

Number of Deaths from each cause amongst different classes, also the Ratio of Deaths from each cause to the Total Deaths from all causes for the whole period, 1840-52.

Cause.	Passengers.		Public by their own Negligence.		Trespassers.		Engine-Drivers.		Stokers.		Guards.		Porters.		Other Servants.	
	Number Killed.	Ratio.	Number Killed.	Ratio	Number Killed.	Ratio.	Number Killed.	Ratio.	Number Killed.	Ratio.	Number Killed.	Ratio.	Number Killed.	Ratio.	Number Killed.	Ratio.
Collision	29	12·72	....	....	....	....	6	9·52	8	7·92	3	3·34	....	....	11	1·92
Off line	35	15·35	....	....	....	....	19	30·16	13	12·87	6	6·67	1	·98	6	1·05
Running into station	5	2·20	....	....	....	....	1	1·59	....	....	....	....	....	....	....	....
Axle breaking	6	2·63	....	....	....	....	....	....	....	....	....	....	....	....	4	·70
Machinery breaking	2	·88	....	....	1	·34	7	11·11	11	10·89	1	1·11	....	....	5	·86
Falling from train	16	7·02	6	4·00	8	2·69	10	15·87	28	27·72	37	41·11	10	9·80	56	9·76
Jumping from train	34	14·91	4	2·67	1	·33	3	4·76	5	4·95	2	2·22	6	5·89	24	4·18
Run over	22	9·65	133	88·66	268	90·24	4	6·35	11	10·89	13	14·44	31	30·39	353	61·50
Collision at station	35	15·35	....	....	....	....	6	9·53	5	4·95	4	4·45	4	3·92	8	1·39
Mounting train in motion	39	17·10	3	2·00	10	3·37	4	6·35	7	6·94	10	11·11	9	8·83	35	6·10
Crushed	5	2·19	4	2·67	9	3·03	3	4·76	13	12·87	14	15·55	41	40·19	72	12·54
Total	228	100·00	150	100·00	297	100·00	63	100·00	101	100·00	90	100·00	102	100·00	574	100·00
Miscellaneous	38	....	25	....	9	....	10	....	15	....	37	....	15	....	74	....

ABSTRACT S.

Ratio of Injured to Killed amongst Engine Drivers, Stokers, and Guards, from different causes.

Causes.	Killed.	Injured.	Ratio of Injured to Killed.
Collisions, running off line, and collisions at stations	70	118	168·57 per cent.
All other causes	246	199	80·89 ,,

It is hence obvious, not only as regards employés, but also passengers, that accidents from "collisions," and from "running off the line," are neither so frequent nor so fatal as has been hitherto so generally believed by the public.

The next point connected with this part of the inquiry, to which attention is directed, is the relative frequency of fatal accidents in recent and more remote years; and, for the purpose of ascertaining how far the tendency to fatal accidents has increased or diminished amongst employés, the following abstract has been prepared, which shows the deaths from all causes in the aggregate among:—

ABSTRACT T.

Period.	Engine Drivers, Stokers, and Guards.			Porters and other Servants.		
	Number Exposed to Risk.	Killed.	One Killed in	Number Exposed to Risk.	Killed.	One Killed in
1840 to 1843....	6,080	27	225	54,134	99	547
1844 ,, 1847....	10,852	100	109	96,548	223	433
1848 ,, 1851....	23,454	148	158	209,000	361	579
1852	7,252	41	177	64,619	82	788
1840 to 1852....	47,638	316	151	424,301	765	555

When a similar investigation was made into the relative frequency of fatal accidents to passengers, in Abstract H, it was most satisfactory to find so rapid and so decided a diminution of them in recent years. But, although in the present instance it would appear that, among railway servants, the mortality from accidents was not so high in the first as in the period immediately succeeding, still it is gratifying to find a still more marked and decided diminution in the rate of mortality among railway servants since the year 1844, than has even taken place amongst passengers. According to Abstract H, it will be found that the decrease in mortality of passengers, within the same period, was in the ratio of 230 to 289; while, amongst the group engine-drivers, stokers, and guards, the decrease has been in the ratio of 109 to 177; but if the ratio had been in accordance with that for passengers, it would have been as 109 to 137 only. Again, in the group porters and other servants, the decrease of mortality has been as 433 to 788; but if the ratio had been the same as that for passengers, it would have been as 433 to 544 only. It will thus be seen that the diminution of fatal accidents among the

second group of railway servants is somewhat greater than in even the first group.

Few, if any persons, were, until recently, distinctly aware of the great diminution of fatal accidents amongst railway passengers; but the facts in Abstract H, of the former paper, have now sufficiently established the truth of the great improvements in this respect of railway travelling in recent years; and the evidence now brought forward in Abstract T is of a still more satisfactory and welcome nature; for while, in the period under review, the mortality of railway passengers has diminished 21 per cent., that of railway servants, taking both groups, has, in the same time, decreased no less than 78 per cent. It must hence be evident to every inquirer that great improvement in the management of the railway system of this country has taken place within the last ten years, to whatever cause that improvement may be due. The risk of life and limb has greatly diminished among all classes, whether travellers or employés.

In the preceding paper, an ample illustration was given of the distinction intended to be implied between accidents "beyond control of the companies" and those "under control of the companies;" and that part of the question was sufficiently discussed, so far as passengers are concerned; and it is now proposed to investigate it in relation to employés.

The following abstract furnishes the principal facts for the period 1840-51:—

ABSTRACT U.

Deaths amongst Employés from causes Beyond Control of Companies, also from causes Under Control of Companies, 1840-51.

Causes.	Class of Persons.									
	Engine Drivers.		Stokers.		Guards.		Porters.		Other Servants.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
(*a*)—Beyond control of the Companies	24	31	56	42	61	27	46	15	438	143
(*b*)—Under control of the Companies, including Miscellaneous	38	53	42	64	54	57	52	41	147	141
Per-centage of (*a*)	38·71	36·90	57·14	39·62	53·04	32·14	46·94	26·79	74·87	50·35
Per-centage of (*b*)	61·29	63·10	42·86	60·38	46·96	67·86	53·06	73·21	24·13	49·65

In Abstract I, page 317, of former paper, the fatal accidents to passengers, assumed to be "under control" of the companies, were found to be 55·3 per cent. of the whole; but in this abstract it will be seen, that, with the exception of the class engine-drivers, the ratio of accidents "under control of the companies" are, as a whole, considerably under that for passengers. In the preceding abstract, the accidents in the miscellaneous or unclassified group are placed among

those "under control of the companies;" but the more correct mode of comparison is clearly, for the reasons assigned in page 318 of former paper, to exclude them; and, therefore, in the next abstract which has been prepared to show whether the accidents, assumed to arise from causes under the companies, be increasing or diminishing, the miscellaneous group is not taken into account:—

ABSTRACT V.

Deaths among Different Classes of Employés, showing those from Causes beyond the Control of the Companies, and those not under such Control.

Causes.	Engine Drivers, Stokers, and Guards.			Porters and Other Servants.		
	1840-43.	1844-47.	1848-51.	1840-43.	1844-47.	1848-51.
Beyond control of Company.....	19	44	78	80	177	227
Under control of Company, excluding Miscellaneous	3	36	42	15	32	77
Mortality Per Cent. of each Class to the Total.						
Beyond control of Company.....	86·37	55·00	65·00	84·21	84·69	74·67
Under control of Company, excluding Miscellaneous	13·63	45·00	35·00	15·79	15·31	25·33

If the results in this be compared with those in the preceding abstract, a very important distinction will be observable, the ratio of accidents assumed as "under control of the companies" being very much less, arising from the group of accidents in the miscellaneous or undefined groups being excluded. But there is one feature appearing in Abstract V. of anything but a satisfactory nature, namely, that the ratio of accidents "under control of the companies," in reference to the total deaths from all causes, have, contrary, to that which was found to prevail in Abstract J in regard to passengers, been increasing. In page 315, however, of the former paper, while describing Table XXI., it was clearly shown that, although such modes of exhibiting the relation of statistical facts have some uses, still serious objections may be brought against them when any exact or strict investigation is attempted. In order, therefore, to avoid such objections, the following table has been prepared on the plan of Abstract K, and which is similar in some respects to Table XXXV., only that the accidents arising from causes "under control of companies" are distinguished from those considered as "beyond the control of companies." The first section of which shows the ratio of deaths from causes "beyond" and "under" control of the companies, in the same manner as that followed in Abstract V., only more in detail; but the second section of the same table furnishes the exact ratio of mortality per annum to the numbers exposed to risk in each class of employés:—

Table XXXVI.

Number and Ratio per Cent. of Deaths from causes Beyond and Under Control of the Companies to the Total Deaths from all ascertained causes, for each class of Employés.

Causes.	Deaths of Engine Drivers.						Deaths of Stokers.						Deaths of Guards.					
	1840-43.		1844-47.		1848-51.		1840-43.		1844-47.		1848-51.		1840-43.		1844-47.		1848-51.	
	Number.	Per Cent. of Total.	Number.	Per Cent. of Total.	Number.	Per Cent. of Total.	Number.	Per Cent. of Total.	Number.	Per Cent. of Total.	Number.	Per Cent. of Total.	Number.	Per Cent. of Total.	Number.	Per Cent. of Total.	Number.	Per Cent. of Total.
Beyond control of Companies	6	85·72	8	32·00	10	47·62	6	85·72	21	61·76	29	65·91	7	87·50	15	71·43	39	70·91
Under control of Companies	1	14·28	17	68·00	11	52·38	1	14·28	13	38·24	15	34·09	1	12·50	6	28·57	16	29·09

Causes.	Deaths of Porters.						Deaths of other Servants.					
	1840-43.		1844-47.		1848-51.		1840-43.		1844-47.		1848-51.	
	Number.	Per Cent. of Total.	Number.	Per Cent. of Total.	Number.	Per Cent. of Total.	Number.	Per Cent. of Total.	Number.	Per Cent. of Total.	Number.	Per Cent. of Total.
Beyond control of Companies	8	57·14	15	55·56	23	53·49	72	88·89	162	89·01	204	78·16
Under control of Companies	6	42·86	12	44·44	20	46·51	9	11·11	20	10·99	57	21·84

Exact Rate of Mortality per Annum to the Number Exposed to Risk in each Class.

Causes.	Deaths of Engine Drivers.			Deaths of Stokers.			Deaths of Guards.			Deaths of Porters.			Deaths of other Servants.		
	1840-43.	1844-47.	1848-51.	1840-43.	1844-47.	1848-51.	1840-43.	1844-47.	1848-51.	1840-43.	1844-47.	1848-51.	1840-43.	1844-47.	1848-51.
Number exposed to risk ...	2,051	3,658	7,910	2,127	3,800	8,205	1,902	3,394	7,339	8,985	16,037	34,677	45,149	80,511	174,323
Beyond control of Companies	6	8	10	6	21	29	7	15	39	8	15	23	72	162	204
Under control of Companies	1	17	11	1	13	15	1	6	16	6	12	20	9	20	57
Ratio of, Beyond control of Companies	One in 342	One in 457	One in 791	One in 354	One in 181	One in 283	One in 272	One in 226	One in 188	One in 1,123	One in 1,069	One in 1,508	One in 627	One in 497	One in 855
Ratio of, Under control of Companies	2,051	215	719	2,127	292	547	1,902	566	459	1,497	1,336	1,734	5,017	4,026	3,058

The second section of this table is calculated to throw important light on the question of railway accidents, as they affect the different classes of employés, both as regards the causes "beyond control of the companies" and those assumed to fall "under control of the companies." In describing Abstract T, it was pointed out that, ever since 1844, the accidents from all causes have been diminishing; so also, in the preceding table, will it be found that generally in each class of servants have the fatal accidents been decreasing within the same period, whether viewed in respect to the causes "beyond control of the companies" or otherwise, the chief exception being in the group of "other servants" for accidents from causes "under control of companies." The following abstract, however, of this table will place the question in a clearer light:—

ABSTRACT W.

Ratio of Deaths amongst Employés from causes Beyond and Under Control of the Companies, 1840-51.

	Engine-Drivers, Stokers, and Guards.			Porters and other Servants.			Engine-Drivers, Stokers, Guards, Porters, and other Servants.		
	1840 to 1843.	1844 to 1847.	1848 to 1851.	1840 to 1843.	1844 to 1847.	1848 to 1851.	1840 to 1843.	1844 to 1847.	1848 to 1851.
Number exposed to risk	6,080	10,852	23,454	54,134	96,548	209,000	60,214	107,400	232,454
Beyond control of Companies	19	44	78	80	177	227	99	221	305
Under control of Companies ...	3	36	42	15	32	77	18	68	119
Ratio of, Beyond control of Companies	One in 320	One in 247	One in 301	One in 677	One in 545	One in 921	One in 608	One in 486	One in 762
Ratio of, Under control of Companies.....	2,027	302	558	3,609	3,017	2,714	3,345	1,579	1,953

It is thus obvious that, so far as engine-drivers, stokers, and guards are concerned, there has been a decided decrease in the accidents, both from causes "beyond" and "under" control of the companies, and, consequently, an absolute decrease in the mortality from all causes; but in the case of porters and other servants, it will be found that, while the deaths from causes "beyond the control of companies" have diminished in a very marked manner, those from causes "under control of companies" have increased. In the last section of the preceding abstract, it will, however, be seen that, viewing all the railway employés in the aggregate, there has been a decided decrease in the deaths from both classes of accidents, whether from causes beyond or under control of the companies. In Abstract K, it will be found that, among passengers, although the deaths from all causes had largely decreased since 1844, still those from causes "beyond the control of the companies," in that period, increased, but not in so great a ratio as the deaths from causes "under the control of the companies," had diminished. The decrease from causes "under the control of the companies," it will be observed,

by comparing the results of Abstract R for passengers with those of Abstract W for employés, is very nearly the same within the period 1844-51. From the principle on which Tables XXXI., XXXII., and XXXIII., have been formed, it is questionable whether the number of employés therein deduced as being in the service of the companies prior to the year 1844, can be safely relied on, although subsequent to that period they may be considered as strictly applicable to the purposes to which they have been applied in this contribution; in fact, subsequent to 1847, a census has been taken in the alternate years. Looking, however, at the figures determined for the years 1840-43, it is to be doubted whether the number of employés then in actual service was not much less than stated in the tables just referred to. For other reasons than those appearing from an examination of the figures in Table XXXIII., it may be fairly assumed that, in the early period of railway management, a less number of employés was required in the railway service, *pro-rata* to the extent of the line of railway open to traffic; for it has already been shown, in the early part of this communication, that both the passenger and goods traffic have increased in a much higher ratio than the extent of miles of railway open to traffic, and, consequently, the number of railway employés has also increased in a like high ratio. This is an important consideration to bear in mind while engaged on this part of the inquiry which relates to employés only. The same difficulty did not arise while engaged in the examination of a similar question in respect to passengers, for the number of passengers and the extent of mileage were known for each year of the whole period under observation; but, as already stated, no census of railway employés was available for the purpose of this inquiry until May, 1848. Assuming that the remarks now advanced, in respect to the estimated number of employés given in Table XXXIII., are generally correct, it will follow that the actual rate of mortality among railway employés, for the period 1840-43, was much greater than that shown in the preceding tables and abstracts, and hence, in the present state of the investigation of this question, it would be difficult to positively assert whether, as in the case of passengers, the mortality of employés has not also uniformly diminished ever since 1840, notwithstanding the indications to the contrary contained in Table XXXVI. and Abstract W.

Whatever opinions may be held as to the improvements likely to take place in railway management for the future, for the protection of the lives of passengers and employés, one thing is quite certain, that, in the period within which observations and recorded facts may be safely relied on, great improvements must have been effected in the management of railway affairs; and more credit is due to those intrusted with the conduct of these matters than either the public press or the people of this country for a long time seem disposed to accord to them.

In pages 320-32 of the preceding paper will be found important facts and deductions in relation to "collisions;" and although that portion of the inquiry had special reference to passengers, many of the observations are equally applicable to the case of employés. The following table exhibits the number of deaths taking place from collisions at stations, and from collisions not at stations, during the period 1844-51:—

TABLE XXXVII.

The Number and Ratio of Deaths from Collisions during the Years 1844-52, *happening at Stations, and from Collisions not at Stations, among*

Period.	Engine Drivers.				
	Number.	Not at Station.		At Station.	
		Killed.	One in	Killed.	One in
1844 to 1847.....	3,658	4	914	2	1,829
1848 „ 1851.....	7,910	2	3,955	1	7,910
1852	2,446	..	..	3	815
1844 to 1852.....	14,014	6	2,336	6	2,336

Period.	Stokers.				
	Number.	Not at Station.		At Station.	
		Killed.	One in	Killed.	One in
1844 to 1847.....	3,800	2	1,900	2	1,900
1848 „ 1851.....	8,205	3	2,735	2	4,102
1852	2,537	2	1,268	1	2,537
1844 to 1852.....	14,542	7	2,077	5	2,908

Period.	Guards.				
	Number.	Not at Station.		At Station.	
		Killed.	One in	Killed.	One in
1844 to 1847.....	3,394	2	1,697	1	3,394
1848 „ 1851.....	7,339	1	7,339	3	2,446
1852	2,269	..	..	..	..
1844 to 1852.....	13,002	3	4,334	4	3,251

Period.	Porters.				
	Number.	Not at Station.		At Station.	
		Killed.	One in	Killed.	One in
1844 to 1847.....	16,037	..	..	2	8,018
1848 „ 1851.....	34,677	..	..	1	34,677
1852	10,722	..	..	1	10,722
1844 to 1852.....	61,436	..	..	4	15,359

Period.	Other Servants.				
	Number.	Not at Station.		At Station.	
		Killed.	One in	Killed.	One in
1844 to 1847.....	80,511	2	40,255	1	80,511
1848 „ 1851.....	174,323	4	43,581	7	24,903
1852	53,897	5	10,779	..	..
1844 to 1852.....	308,731	11	28,066	8	38,591

It will be seen that this class of accidents, which, in the case of passengers, was shown, at page 320, to constitute nearly 59 per cent. of all accidents assumed to be under the control of the companies, does, in regard to employés, amount to little more than 21 per cent. of all the accidents arising from causes under the control of the companies; and this is a distinction which it is of much importance to keep in view, as it is calculated to throw much light on the proximate cause of accidents in railways, and the direction in which improvements are more immediately to be looked for. With this object in view, the following abstract has been prepared, showing of the causes assumed to be under control of the companies, the degree in which each particular class of employés is subject to each kind of accident, as well as the relation between each class of employés, and also all employés in the aggregate, to passengers in this respect:—

ABSTRACT X.

The Number of Deaths amongst Railway Employés, and amongst Passengers, during the Years 1840-52, *from accidents Under Control of the Companies.*

Cause of Accident.	Class of Employés.						
	Engine Drivers.	Stokers.	Guards.	Porters.	Other Servants.	Total of Employés.	Passengers.
Collision	6	8	3	....	11	28	29
Off line	19	13	6	1	6	45	35
Running into station	1	....	....	....	....	1	5
Collision at station	6	5	4	4	8	27	35
Crushed	3	13	14	41	72	143	5
Total	35	39	27	46	97	244	109

Accidents from collisions are, relatively to the whole of the above class of accidents, obviously not so fatal to any one class of railway servants, nor consequently to the whole collectively, as to passengers.

In the former paper a very complete investigation was made of the various circumstances under which collisions took place, distinguishing those collisions at stations from those not at stations, and also those in which the immediate cause was due to the state of the weather, defects in machinery, neglect, and to other circumstances; besides, it was further shown to what extent the various accidents from collisions arose from passenger trains running into other passenger trains, from passenger trains into trains of another sort, from trains other than passenger trains into passenger trains, and from trains, neither of which were passenger trains. And although the data then brought forward had more especial reference to the injuries sustained by passengers, the facts were quite as completely given in regard to employés themselves, and it is therefore now unnecessary to enlarge on the particular questions then discussed. In respect, however, to the preceding abstract of this group of accidents, namely, those assumed to be under control of the companies, the following modification in the way of exhibiting the results will show

the relative frequency of each kind of accident to all causes of the same group of accidents.

ABSTRACT Y.

Ratio of Deaths amongst each Class of Railway Employés and amongst Passengers, during the Years 1840-52, *from each kind of Accident Under Control of the Companies, to the Deaths from all causes assumed as being Under Control of the Companies.*

Cause of Accident.	Class of Employés.						
	Engine Drivers.	Stokers.	Guards.	Porters.	Other Servants.	Total of Employés.	Passengers.
Collision	17·14	20·52	11·11	....	11·34	11·47	26·60
Off line	54·29	33·33	22·22	2·17	6·18	18·44	32·11
Running into station	2·86	....	....	....	....	0·41	4·59
Collision at station	17·14	12·82	14·82	8·70	8·25	11·07	32·11
Crushed	8·57	33·33	51·85	89·13	74·23	58·61	4·59

The following are the causes amongst those assumed to be under control of the companies, which are most fatal to each class of persons, viz.:—

In the class—				
Engine Drivers	Running off line.....	= 54·2	per cent.	of the whole of the above
Stokers	{Collisions off line, and Crushed are equal}	= 33·3	,,	,,
Guards	Crushed	= 51·9	,,	,,
Porters	Do.	= 89·1	,,	,,
Other Servants	Do.	= 74·2	,,	,,
Total Employés....	Do.	= 58·6	,,	,,
Passengers.....	Collisions	= 58·7	,,	,,

Of the accidents under control of the companies, it is remarkable to observe that of the deaths among employés how great a proportion comes under the denomination "crushed," particularly so amongst porters and other servants. Even in the whole group of employés the ratio from this cause is as high as 58·61 per cent., while amongst passengers it is no more than 4·59 per cent.; and, therefore, by keeping these facts in view there can be no difficulty in understanding the great discrepancy between the ratio of killed and injured among employés and passengers.

Having said this much in regard to the way in which different classes of persons are affected by different kinds of accidents, we shall now return to the subject of Table XXXVII. The following is a condensed abstract of it, and will afford a ready means of judging how far fatal accidents from collisions have decreased in recent years.

ABSTRACT Z.

Ratio of Fatal Accidents from Collisions at different periods amongst Railway Employes.

Period.	Engine Drivers, Stokers, and Guards.					Porters and other Servants.				
	Number Exposed to Risk.	Not at Station.		At Station.		Number Exposed to Risk.	Not at Station.		At Station.	
		Killed	One in	Killed.	One in		Killed.	One in	Killed.	One in
1844–47	10,852	8	1,356	5	2,170	96,548	2	48,274	3	32,183
1848–51	23,454	6	3,909	6	3,909	209,000	4	52,250	8	26,125
1852...	7,252	2	3,626	4	1,813	64,619	5	12,924	1	64,619
1844–52	41,558	16	2,597	15	2,770	370,167	11	33,651	12	30,847

It is hence obvious that so far as the first group of servants are concerned, the danger of fatal accidents from collisions of both kinds has greatly decreased in recent years, but in regard to collisions at stations such has not been the case amongst the other group of railway servants, namely, "porters and other servants."

The next part of this question to which attention is directed is similar to that contained in Abstract M of the preceding paper, which showed the accidents which had happened to passengers from collisions with trains of different kinds. At page 329 it will be found that throughout the whole period of nine years, 1844-52, but one death of a passenger took place from collisions of "express" trains, and also only one from collision of "excursion," while none happened from collision of mail trains, the "ordinary" trains being most fatal to passengers; so also will the same thing be found with regard to employés. The following condensed abstract from Table XXV. gives a general view of the results arrived at.

ABSTRACT Aa.

Ratio of Deaths and Injuries amongst Employés to the Number of Collisions during 1844-52.

Trains.	Collisions.		Employés.		Ratio of Deaths and Injuries to			
	Non-Serious.	Serious.	Killed.	Injured.	All Collisions.		Serious Collisions.	
					Killed.	Injured.	Killed.	Injured.
Express	3	8	2	11	·182	1·000	·250	1·375
Excursion ..	1	7	....	....	....	....	....	....
Mail.....	8	13	4	8	·190	·381	·308	·615
Ordinary	42	173	22	57	·102	·265	·127	·329
Total	54	201	28	76	·110	·298	·139	·378

Although the "ordinary" trains have had the greatest number of collisions, and have been also the most fatal from this class of acci-

dents, yet when a collision of either an "express" or a "mail" train has taken place, it has proved more fatal to employés than a collision of an "ordinary train;" but on referring to Abstract M the reverse will be found to have been the case in regard to passengers, the collisions of "ordinary" trains being not only more frequent but also more severe and fatal than those of "express," "excursion," and "mail" trains.

In regard to the tendency which accidents from collisions have had, since the year 1844, to occasion a greater or a less ratio of non-fatal injuries amongst employés, it will be seen from the following abstract that in the classes engine drivers and guards there has been a marked and most decided decrease, varying, amongst engine drivers, from 1 in 366 to 1 in 805 per annum, and amongst guards from 1 in 566 to 1 in 1,135 yearly. In the class stokers, however, which appears much more liable to accidents of this kind than the other two classes, it will be observed that during the period 1848-51 the ratio of injuries was less than in either the preceding or subsequent period, but still, while the ratio was as high as 1 in 292 in the first period, it became reduced to 1 in 507 in 1852.

ABSTRACT A*b*.

The Number and Ratio of Injuries from Collisions during the Years 1844-52, *happening at Stations, and from Collisions not at Stations, among*

Period.	Engine Drivers.			Stokers.			Guards.		
	Number.	Injured.	One in	Number.	Injured.	One in	Number.	Injured.	One in
1844 to 1847	3,658	10	366	3,800	13	292	3,394	6	566
1848 ,, 1851	7,910	10	791	8,205	8	1,026	7,339	8	917
1852	2,416	3	805	2,537	5	507	2,269	2	1,135
1844 to 1852	14,014	23	609	14,542	26	559	13,002	16	813

The next part of this question which is to be considered is that of the fatal accidents to employés from trains "running off the line." According to Abstracts R and X this cause of accidents has been more fatal to engine drivers, stokers, and guards, than collisions; but it has been otherwise to the other railway servants and to passengers. It will also be observed that of 45 deaths amongst employés from trains running off the line, no less than 38 are recorded as happening to engine drivers, stokers, and guards; and this is only what might be expected, as they are more than any other of the employés exposed to this kind of accidents, while porters and other servants are more liable to death and injury from being crushed, as shown in Abstracts X and Z. The following table shows the deaths and injuries resulting from trains running off the line, since the year 1844:—

TABLE XXXVIII.

The Number and Ratio of Deaths and Injuries from Trains running "Off the Line" during the Years 1844-52, *among*

Period.	Engine Drivers.			Stokers.			Guards.		
	Number.	Off Line.		Number.	Off Line.		Number.	Off Line.	
		Killed.	One in		Killed.	One in		Killed.	One in
1844 to 1847	3,658	11	333	3,800	4	950	3,394	1	3,394
1848 ,, 1851	7,910	5	1,582	8,205	5	1,641	7,339	2	3,670
1852	2,446	3	815	2,537	4	634	2,269	3	756
1844 to 1852	14,014	19	738	14,542	13	1,119	13,002	6	2,167
Period.	Number.	Injured.	One in	Number.	Injured.	One in	Number.	Injured.	One in
1844 to 1847	3,658	7	523	3,800	8	475	3,394	6	566
1848 ,, 1851	7,910	9	879	8,205	5	1,641	7,339	2	3,670
1852	2,446	5	489	2,537	3	846	2,269	3	756
1844 to 1852	14,014	21	667	14,542	16	909	13,002	11	1,182

One of the most startling results appearing in this inquiry will be found in the preceding table. It will be seen that whether attention be directed to the number of deaths or the number of non-fatal injuries, that in the year 1852 the ratio for each class was amazingly increased beyond that of the period of years immediately preceding, namely, 1848-51. The very wonderful rate of increase in this class of accidents during the year 1852 is difficult to be understood, and it will not be found easy to account for so extraordinary an increase in the deaths and injuries of employés from this class of accidents during the year 1852. On referring to Table XXVIII. it will be seen that the number of trains or parts of trains which actually ran off the rails in that year, was not only relatively to the extent of railway communication open to traffic, but also to the number of persons employed in the service of the companies less than in the preceding period; but likewise the deaths and injuries of passengers from trains running off the line during 1852 were greatly below the averages of the years 1848-51. In 1852 not a single passenger was killed from trains running off the line, and not more than 17 were injured, while in the period preceding 1848-51, the number killed from the same cause was 16, and that injured 96, or 4 per annum killed and 24 injured. It will be found impossible to account for this discrepancy between the deaths and injuries of employés and passengers, on the supposition of an undue proportion of the accidents from trains "running off the line" having happened to goods' and other trains not carrying passengers, for by referring

to Table XXX. it will be seen that not a single case occurred of a goods' train running off the line in the year 1852, and, consequently, no death or injury is recorded from that cause. Of the 14 recorded instances of "running off the line," given in Table XXX. it will be seen that

None occurred to goods' trains.
One only to engines—resulting in no deaths, but injury to one employé, and
Thirteen occurred to passenger trains.... } resulting in no death amongst passengers, but injuring 17 of them, while no less than 10 employés were killed and 11 injured.

Results of so curious and anomalous a nature are certainly very striking, and must enlist the sympathies of every inquirer on behalf of the more important classes of the railway employés, who are thus exposed to so frightful a sacrifice of life and limb while engaged in discharge of their duties. It is to be lamented that some more effectual means than are yet in use have not been taken to avert the recurrence of such distressing and calamitous accidents, but I trust the efforts now made to bring this Analysis prominently before the public may not be altogether devoid of some beneficial influence in directing the attention of those in authority to so vitally important a subject.

It is proposed to bring under review, in the next number of this Journal, a condensed summary of railway accidents as they affect passengers and *employés* on the continental railways; and then, as stated in the last paragraph of the preceding portion of this communication, when the whole body of facts is presented, it may be possible to offer some suggestions of practical importance in the prevention of railway accidents.